https://dx.doi.org/10.22161/ijreh.3.2.1 ISSN: 2456-8678

Capuchin Monkey (*Cebus apella*) Telencephalon: Macroscopic Anatomic Study

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Abstract—*Comparative anatomy goes back to antiquity, since Aristotle (384-323 a.C.) already studied animals, emphasizing their anatomical forms and structural organization. The study of anatomical characteristics, mainly with comparative approach, also associates "modus vivendis" of individual or taxonomic group. In this sense, this paper purposes to study and describe macroscopic anatomy of Capuchin Monkey telencephalon, in view to knowledge about biology system of this animal, as an important faunal component of Cerrado biome. For this, one male and one female specimen of Capuchin Monkey were analyzed, obtained from accidental death on the roadsides of Brazilian Southeast of Goiás, under authorization of SISBIO nº 37072-2 and procedures conducted in accordance with ethical principles approved by Institutional Ethics in Research Committee of Federal University of Uberlândia (CEUA/UFU nº 067/12). Capuchin Monkey (Cebus apella) telencephalon is relatively large in relation to the size of this animal, with globose aspect and slightly long laterolaterally, narrowing abruptly in rostral sense. In general terms, it resembles human brain, however, presents little convolute and less number of sulcus and gyrus and less prominent giving somewhat lisencecephalic aspect.*

Keywords— Comparative Anatomy, Dissecation, Neuroanatomy, Cerrado Biome and Primates.

I. INTRODUTION

The study of primate´s biology (morphology and behavior) attracted attention, mainly, in relation to similarities to humans. The knowledge of these animals, through comparative anatomy, makes possible understand evolutionary issues by locating taxonomic groups as inferior or superior in phylogenetic scale **[1-4]**. Among them, medium and large mammals suffer effects of habitat alterations and fragmentation, usually in response to human occupation and the particular specie of Capuchin Monkey (*Cebus apella*) that is a small mammal endemic to Brazilian Cerrado, represents the second group with greatest diversity among vertebrates that inhabit this biome, composing approximately 15% of knowledge species **[5,6]**.

However, for better understanding of this specie biology is essential point out that Cerrado is a complex biome, which makes it more important to understand all elements involved **[5,7,8]** and distribution of Capuchin Monkey is not restrict to Cerrado, that can be found from northwest Colombia to south Paraguay and most Brazilian territory (HILL, 1972) **[9]**, where represents essential importance to biodiversity, since it is an omnivore's animal **[1,10]**.

The anatomy of Capuchin Monkey is little known and attracts more attention because its rate cephalization, that is higher than other monkeys like Chimpanzee (*Pan troglodytes*) and Gorilla (*Gorilla gorilla*), besides phylogenetically close to human **[11-13].** It is in Cebidae line that presents larger brain than Hapalids even some authors claim that brain-weight ratio of Cebidae reaches the best rates among primates, including man. In most Cebidae line, cerebral hemispheres exhibit more globular forms than Hapalids, as well more developed sulcus and developed gyrus **[9]**.

The lateral faces of hemispheres present in sylvian sulcus, parallel to post-sylvian or temporal superior and intraparietal arcuate on dorsal end of sylvian and post-sylvian sulcus. In the frontal lobe, there are arched sulcus and surgically, rectum sulcus (inferior frontal fissure) **[9,11,12,14]**. Human brain constitutes the anterior and most evolved part of neural system and general aspects exhibits ovoid shape, where the largest axis is anteroposterior disposed and whose thickest end is posteriorly gyros. The dorsolateral face is strongly convex, while inferior face is irregular and medial face

https://dx.doi.org/10.22161/ijreh.3.1.7 *ISSN: 2456-8678*

flat and vertically disposed **[15]**. The surface of brain exhibits numerous sulcus and the largest is Medial Longitudinal Fissure (MLF), disposed anteroposterior over sagittal plane. MLF divides the brain into right and left part, similar called cerebral hemispheres. A lateral fissure is also evident which is located anteriorly on lateral face and divides two lobes called parietal and temporal **[15,16].**

Telencephalon of domestic canids is also divided by MLF into two parts or right and left hemisphere and is possible identify four lobes (frontal, temporal, parietal and occipital), separated by gyrus and similar fissures to human brain. The sulcus and gyrus travel throughout hemisphere and arise uneven development between cortex and bone **[17]**. In addition, sulcus gyrus orbiter for most part, a sylvian fissure that is equivalent to lateral fissure in humans **[17-19]**. In this sense and considering the importance of Capuchin Monkey to Cerrado biome and that its nervous system anatomy is little know, the present work aimed dissect and made a comparative study about the telencephalon of this animal, contributing to its biological system knowledge.

II. MATERIAL AND METHODS

The present paper is a descriptive and comparative anatomical study with one male and one female specimen of Capuchin Monkey, obtained from accidental death on the roadsides of Brazilian Southeast of Goiás, under authorization of SISBIO nº 37072-2. Considering the descriptive approach of this work, statistical analysis is not necessary. All procedures were conducted in accordance with ethical principles and were approved by the Institutional Ethics in Research Committee at the Federal University of Uberlândia (CEUA/UFU nº 067/12).

The study was made in the research laboratory of human and comparative anatomy from the Federal University of Goiás – RC, where the head skin was removed using scissors, scalpel and anatomical tweezers. The epicranium was dissected and temporal muscles removed, with subsequent removal of skull cap (with help of a gypsum saw and an osteotome), exposing the brain. Then was removed severing cranial nerves, blood vessels and meninges at points where was adhered to the bone, proceeding with removal of dura mater and arachnoid and finally pia mater (with the help of magnifying glass - 10X) and thorough removal of blood vessels, making the piece fit for analysis and description. Subsequently, was made a fixation with aqueous 10 % formaldehyde solution to conservation. The preparation of anatomical pieces was performed under consecrated techniques in Macroscopic Anatomy.

The Sony Cyber® digital camera was used to the photographical documentation and the description nomenclature adopted is the standard of *Nomina Anatomica Veterinaria* **[20]**, elaborated by the International Committee on Veterinary Gross Anatomical Nomenclature.

III. RESULTS

The telencephalon of Capuchin Monkey (*Cebus apella*) is relatively large compared to its size. The aspect is globose and slightly long laterolaterally, narrowing abruptly in rostral sense. In general, resembles human brain, however, presents little convolute and less number of sulcus and gyrus and are less prominent, giving somewhat lisencecephalic aspect. The Medial Longitudinal Fissure, Sylvian Fissure, Central Sulcus and Parietoccipital Sulcus, subdivides hemisphere into Lobes: Frontal, Parietal, Occipital and Temporal.

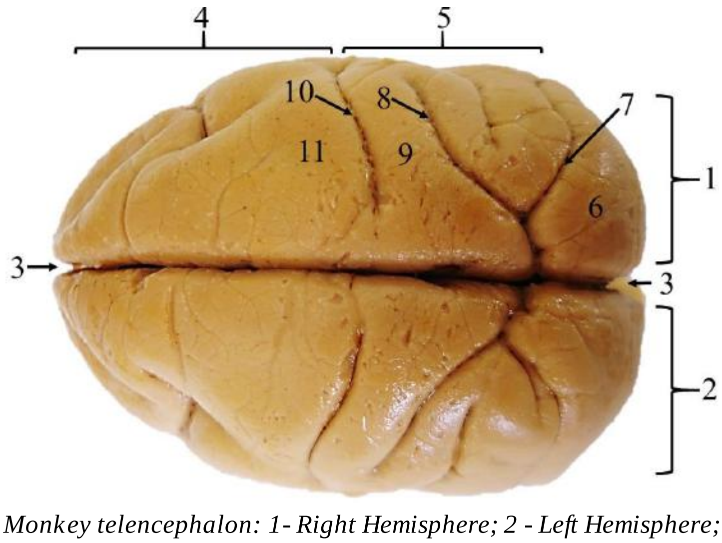


Fig.1: Dorsal view of Capuchin Monkey telencephalon: 1- Right Hemisphere; 2 - Left Hemisphere; 3-Medial Longitudinal Fissure; 4- Frontal Lobe 5 - Parietal Lobe; Occipital Lobe 7- Caudal Branch of Parietoccipital Sulcus; 8- Rostral branch of Parietoccipital Sulcus; 9- Post-central gyrus; 10- Central Sulcus; 11- Pre-central gyrus.

https://dx.doi.org/10.22161/ijreh.3.2.1 ISSN: 2456-8678

In ventrorostral face of each frontal lobe, there is a deep depression caused by contact with dorsal wall of orbit. Like three-dimensional organ that Capuchin Monkey telencephalon exhibits Frontal, Temporal and other Occipital, one dorsolateral face, one medial, one ventrorostral, and one ventral. Irregularities are repeated on all faces and are mostly represented by sulcus and gyrus.

Sulcus and gyrus of dorsolateral face: Dorsolateral face of Capuchin Monkey telencephalon is larger than others. Throughout its extension are present tortuous and sometimes irregular elongated depressions, sulcus of varying extent and depth. Each two or more sulcus delimits relatively smooth, or gyrus, uneven areas. Some sulcus is deeper than others. The Medial Longitudinal Fissure (MLF) is the deepest gyrus of telencephalon and disposed in sagittal plane or divides the hemp in right and left hemisphere. Dorsolateral face of each hemisphere cut by a deep sulcus arranged rostrocaudally, is the sylvian fissure or lateral fissure, which rostral half is slightly inclined ventrodorsally, but caudal part inclines strongly, becoming almost vertical in interior of parietal lobe.

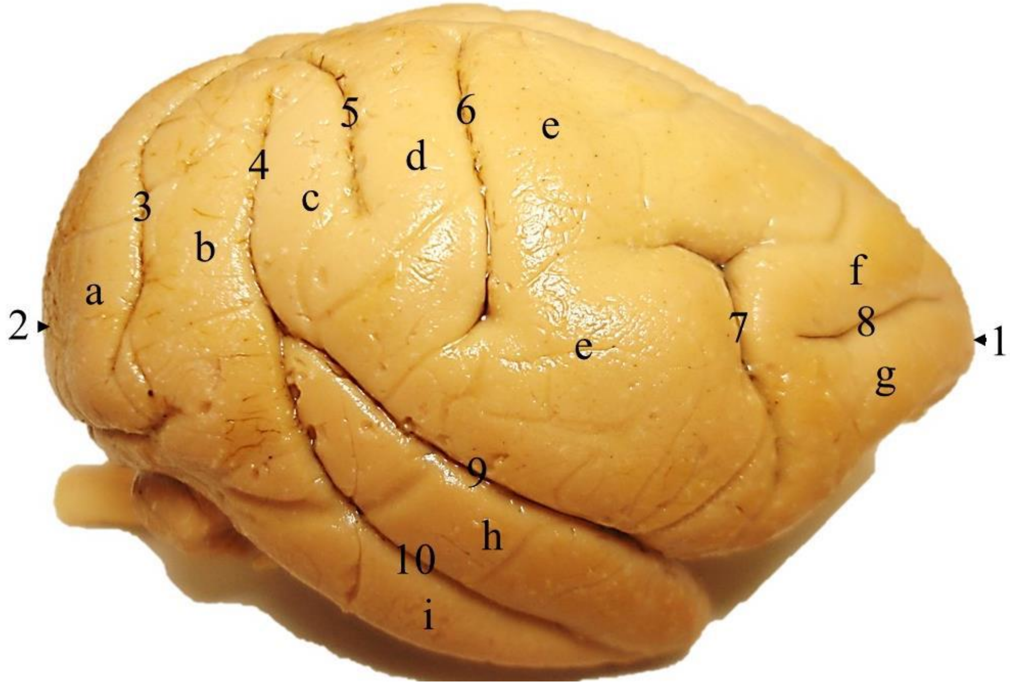


Fig.2: Right Side View of Capuchin Monkey telencephalon: 1- Rostral Pole; 2- Caudal Pole; 3 - Parietal Circumstance Caudal Branch; 4- Ascending branch of lateral cleft (Sylvian); 5- Rostral Branch of Parietoccipital Sulcus; 6- Central Sulcus; 7- Precocious gyrus; 8- Frontal Sulcus; 9- Fissure Lateral Horizontal Branch; 10- Intratemporal sulcus; a- Occipital Gyrus; b- Post-sylvian gyrus; c- Pre-Sylvian Gyrus; d- Post-central gyrus; e- Pre-central gyrus; f- Dorsal Frontal Gyrus; g- Ventral Frontal Gyrus; h- Dorsal Temporal Gyrus; i- Ventral Temporal Gyrus.

Lateral fissure can be subdivided into horizontal branch and ascending branch. Halfway between rostral and caudal pole of each hemisphere, disposed perpendicular to medial lateral and longitudinal fissures, there is a well-marked, relatively deep sulcus, circumscribed to width of face, it is the Central Sulcus. Rostrally to Central Sulcus, delimited caudally and laterally by sylvian fissure and medially to longitudinal fissure, circumscribes frontal lobe. In dorsolateral face of frontal lobe are basically two sulcus and three gyrus. A gyrus arranged transversely, which dorsal end divides into rostral and caudal branch, resembling a letter T, is prefrontal sulcus. Rostral to precentral sulcus is obliquely arranged the rostocaudal sense, a rectilinear sulcus is frontal sulcus or straight sulcus. Superficial sulcus is present; apparently only represent landmarks left by blood vessels. The front pole's dorsolateral face consists of three gyrus. Rostral to central sulcus, vertically, there is a large precentral gyrus limited caudally by central sulcus and rostral by precentral sulcus, while tapered rostral part of frontal lobe exhibits two minor gyrus: Dorsal frontal and ventral frontal.

https://dx.doi.org/10.22161/ijreh.3.2.1 ISSN: 2456-8678

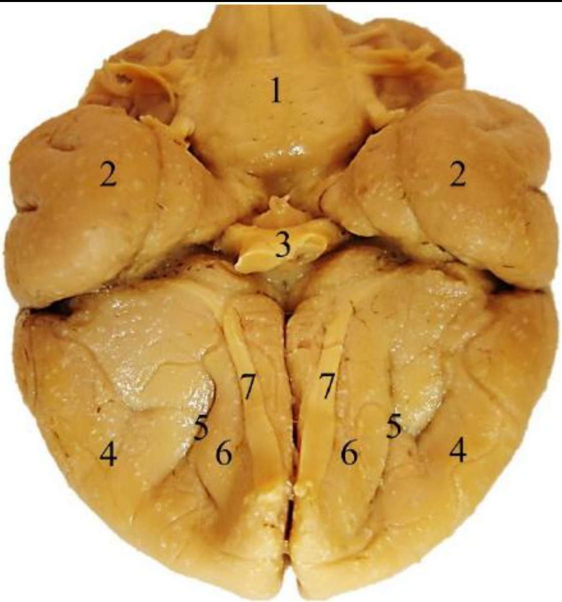


Fig.3: View of the Ventrorostral Face of Capuchin Monkey telencephalon: 1- Brain Trunk; 2- Rostral pole of temporal lobe; 3- Optical chiasm; 4 - Orbital / lateral Gyrus; 5- Orbital Sulcus; 6- Straight / Medial Gyrus; 7- Olfactory Treatment in Sulcus Challenge.

The parietal lobe is evidenced in dorsolateral face of each hemisphere, whose rostral limit is central and caudal sulcus, caudal branch of lateral extension parietoccipital sulcus. Caudal to central sulcus there is a deep sulcus parallel to central and representing rostral branch of parietoccipital sulcus, is postcentral sulcus. The parietal lobe consists of three gyrus: postcentral, pre-sylvian and post-sylvian. On the other hand, dorsolateral face of occipital lobe consists of one large gyrus, the occipital gyrus whose rostral limit is caudal branch of parietoccipital sulcus and the caudal limit is caudal pole of hemisphere. In the dorsolateral face of Capuchin Monkey telencephalon, ventrally to sylvian fissure, the temporal lobe. On lateral face of temporal lobe is a large intratemporal sulcus, arranged rostro-caudally-dorsally, converging to sylvian fissure at the point where curves dorsally. Obliquely disposed sulcus separates temporal lobe from occipital, the occipitotemporal lateral sulcus. The sylvian fissure and intratemporal sulcus delimit the dorsal temporal gyrus, while ventral temporal gyrus is delimited, dorsally, by intratemporal sulcus and ventrally, already in ventral face by occipitotemporal medial sulcus.

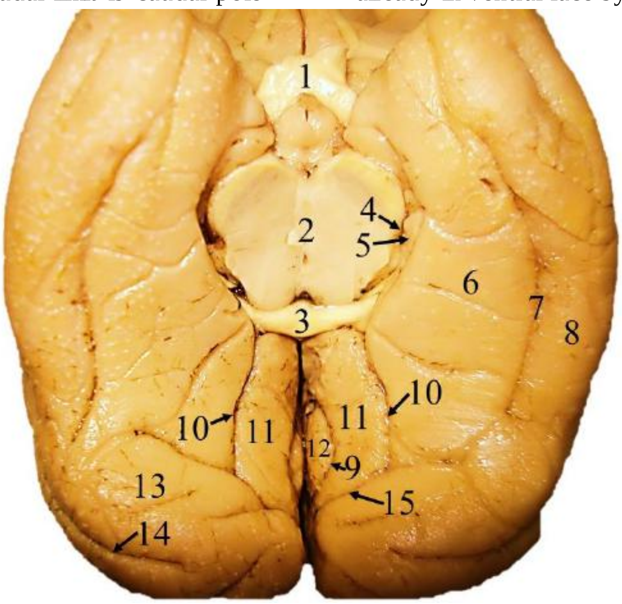


Fig.4: Ventral view of Capuchin Monkey telencephalon: 1- Optical Chiasm; Brain Trunk; 3 - Corpus callosum; 4- Hippocampal Sulcus; 5- Hippocampal gyrus; 6- Parahipocampal Gyrus; 7- Occipitotemporal Sulcus; 8- Occipitotemporal gyrus; 9- Post-splenial Sulcus; 10- Splinter Sulcus; 11- Gyrus of the Cingulum Ventral Part; 12- Gyrus of Cingulum Back; 13- Occipitotemporal gyrus; 14- Occipital Sulcus.

https://dx.doi.org/10.22161/ijreh.3.2.1 ISSN: 2456-8678

Sulcus and gyrus of medial face - The medial face of each hemisphere is relatively flat and vertically oriented. On this face there are five main sulcus: Sulcus of corpus callosum; Sulcus of Cingulum and Sulcus Calcarino, Sulcus Parietoccipital and Gyrus Post-splenial, that is continuation of Parietoccipital. The encephalic mass above Cingulum Sulcus is the Marginal Sulcus and corresponds to border of Dorsolateral Sulcus that advance medially. The sulcus of corpus callosum and cingulum delimit gyrus of cingulum. The Post-Esplenial Sulcus divides the Sulcus of Cingulum into Dorsal and Ventral Parts. Calcarino and Parietoccipital Sulcus delimit Cuneo Sulcus.

Sulcus and Gyrus of Ventrorostral Face -The Ventrorostral Face of Capuchin Monkey telencephalon is the part of Frontal Lobe that rests on dorsal face of the orbit, being deeply marked by this. Its surface is concave due contact with orbital surface that is convex. At the bottom of concavity there is an H-shaped Orbital Sulcus, which divides Ventrorostral Face into Lateral or Orbital and Medial or straight gyrus, however, they are not prominent as a gyrus proper. A sulcus caudally-rostrally disposed near medial border of Frontal Lobe on this face is the Right Sulcus, which contains Olfactory Nerve Tract.

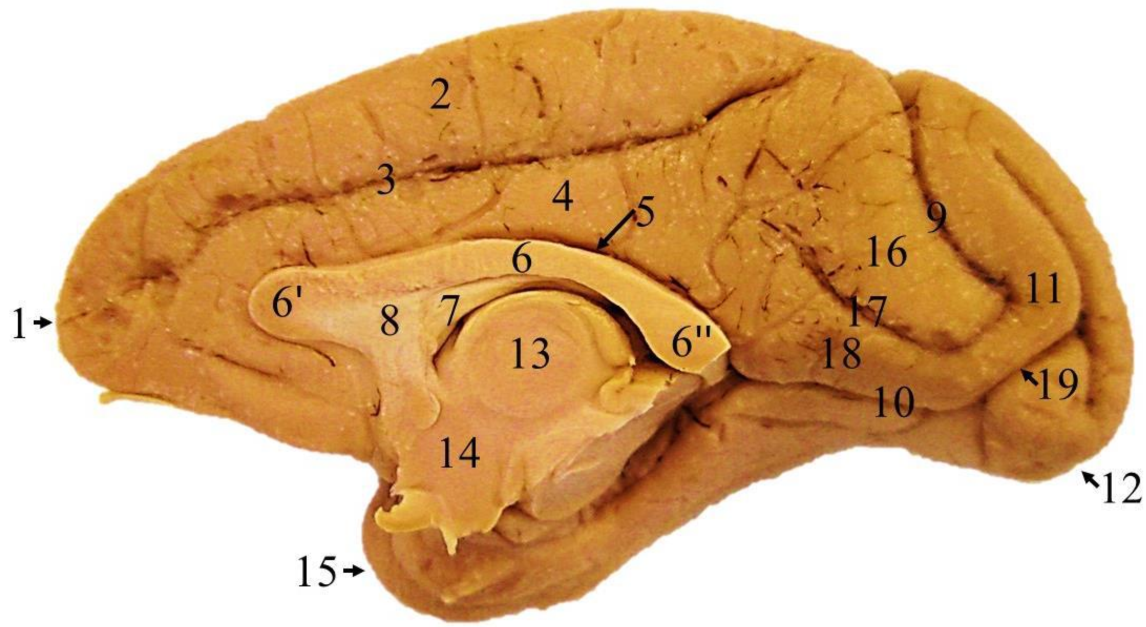


Fig.5: Medial View of Right Hemisphere of Capuchin Monkey telencephalon: 1- Rostral Pole; 2- Front Dorsal Gyrus; 3- Cingulum Sulcus; 4 - Cingulum Gyrus; 5- Sulcus of Corpus Callosum; 6- Corpus callosum; 6´- Knee of Corpus Callosum; 6 '' – Callosum Body Splenius; 7-Formix; 8- Pellucid septum; 9- Parietooccipital Sulcus; 10- Splinter Sulcus; 11- Cuneus; 12- Caudal Pole; 13- Thalamus; 14- Hypothalamus; 15- Temporal Pole; 16- Sulcus of Cingulum Back; 17- Post-splenial sulcus; 18- Sulcus of cingulum in Ventral Part; 19- Calcarine Sulcus.

Sulcus and Gyrus of Ventral Face - The Ventral Face of cerebral hemisphere is narrow and elongated, squeezed between cerebral peduncle and Ventral Temporal Sulcus. It extends through Temporal and Occipital Sulcus and presents a longitudinal sulcus, occipitotemporal sulcus, which divides the face into Occipitotemporal and Ventral Temporal Gyrus. A large sulcus extends from the splenius of Corpus Callosum to Calcarine Sulcus, is Splenial Sulcus that delimits ventral part of Cingulum gyrus, above ventrally to Occipitotemporal Sulcus. Medially, squeezed between Occipitotemporal Gyrus and cerebral peduncle there is a small Hippocampus Gyrus.

All hemispherical faces are visualized as numerous small and irregular sulcus and gyrus, which, due the irregularities are not named. Other structures of Telencephalon present in Medial Face are the Corpus Callosum, divided into Knee, Trunk and Splenial, besides Fornix and Pellucid Septum.

IV. DISCUSSION

According to Testut and Latarjet (1979) **[15]**, in humans; Miller, Christensen and Evans (1964) **[17]**, in domestic dog; and Hill (1953, 1972a and 1972b) **[9]**, in nonhuman primates; The neural system is most evolved. Thus confrontation of literary data on human telencephalon, species previously considered the top of evolutionary scale, with those dogs considered as inferior and non-human primates as intermediaries on the same scale can provide subsidies for evolutionary considerations of neural system.

Capuchin Monkey (*Cebus apella*) is relatively large in relation to size of this animal. Its appearance slightly globular latero-laterally, narrowing sharply in

rostral direction, according to descriptions in Cebidae (e.g. Capuchin Monkey) **[9,21,22]**. Capuchin Monkey brain resembles the human brain **[15]**; however, is less convoluted, presenting fewer sulcus and gyrus and less prominent, giving somewhat lisencephalic aspect. According to Miller, Christensen and Evans (1964) **[17]**, the telencephalon of dogs is more noticeably convoluted than Capuchin Monkey, so perhaps the number and depth sulcus and prominence of gyrus are not such strong aspect for consider neural system more or less evolved.

The brain exhibits Frontal, Temporal and Occipital Pole and Dorsolateral, Medial and Ventral Face, according to descriptions of Miller, Christensen and Evans (1964) **[17]** and Testut and Latarjet (1979) **[15]** respectively in dog and human brain, but in Capuchin Monkey the ventral face is clearly divided into Ventral Face and Ventrorostral Face, in agreement with Hill (1953, 1972a and 1972b) **[9]**, in Cebidae.

Sulcus of Dorsolateral Face: As described by Miller, Christensen and Evans (1964) **[17]**, Testut and Latarjet (1979) **[15]** and Hill (1953, 1972a and 1972b) **[9]** in dogs, humans and cebids respectively, Dorsolateral Face of the brain is larger than others, a characteristic also observed in Capuchin Monkey. Testut and Latarjet (1979) **[21]** and Hill (1953, 1972a and 1972b) **[9]** report a division of telencephalon in right and left hemispheres by FLM and in Frontal, Parietal, Occipital and Temporal lobes, separated by sulcus or fissures more clearly marked as FL, the central sulcus and parietooccipital, characteristics also observed in Capuchin Monkey. Miller, Christensen and Evans (1964) **[17]** do not describe the existence of wolves in cerebral hemispheres of dogs, but show sulcus and sulcus arranged throughout the hemisphere. As described by Testut and Latarjet (1979) **[22]** in Humans and Hill (1953, 1972a and 1972b) **[9]** in Cebidae, sylvian fissure separates Temporal Lobe from Frontal; central sulcus is the border between frontal and parietal lobe, just as parietal occipital sulcus establishes a border between parietal and occipital lobes. This condition is also present in Capuchin Monkey.

Testut and Latarjet (1979) **[21]** describe that humans gyrus and sulcus are circumscribed to the respective lobes, however Miller, Christensen and Evans (1964) **[19]** describe that in dog, the sulcus always extending throughout the hemisphere, while Hill (1953, 1972a and 1972b) **[9]** states in Cebidae that sulcus and sulcus overtake the lobe. In this aspect, Capuchin Monkey shows similar conditions to descriptions in other cebids, since sulcus are circumscribed to a lobe and some gyrus occupy more than one lobe.

According to Miller, Christensen and Evans (1964) **[17]**, dorsally to Sylvian Fissure there are several concentrically arranged sulcus, which in the ventrodorsally sense, are called: Ecto Sylvian Sulcus, Supra Sylvian Sulcus and Lateral Sulcus. On the other hand, Capuchin Monkey does not present this arrangement of sulcus and gyrus, in dorsolateral face of telencephalon, but an organization of the same intermediary between domestic and human canids. In addition, lateral face is cut longitudinally by a deep gyrus, the Sylvian Fissure, which is also present in Capuchin Monkey, but is slightly inclined ventrodorsally in 2/3 caudally and vertically in rostral third, and can be subdivided into Horizontal Branch and Ascending Branch.

As described by Miller, Christensen and Evans (1964) **[17]**, Ectosylvian and Supra Sylvian sulcus are semicircular in shape and can be divided into parts: Caudal, Medial and Rostral. The lateral sulcus is the most rectilinear of sulcus of this face and disposed parallel to LMW, rostrally called Coronal Sulcus. According to Testut and Latarjet (1979) **[15]**, in humans a Central Sulcus is observed that positioned vertically in medial part of hemisphere and later delimits Frontal Lobe and previously the Parietal Lobe. In Capuchin Monkey, halfway between Rostral and Caudal Pole of each Hemisphere, Central Sulcus is disposed perpendicular to Medial Lateral and Longitudinal Fissures, which is well marked and relatively deep, but circumscribed to the face width.

The Ectosylvian and Supra Sylvian sulcus are semicircular in shape and can be divided into Caudal, Medial and Rostral **[17]**. Lateral sulcus is the most rectilinear of sulcus in this face and disposed parallel to LMW, rostrally is called Coronal Sulcus. In humans, according to Testut and Latarjet (1979) **[15]**, a Central Sulcus is observed positioned vertically in medial part of hemisphere and later delimits Frontal Lobe and previously Parietal Lobe. In Capuchin Monkey, halfway between Rostral and Caudal Pole of each Hemisphere, Central Sulcus is disposed perpendicular to Medial Lateral and Longitudinal Fissures, which is well marked and relatively deep, but circumscribed to the face width.

The rostral part of Lateral Sulcus, in dog, is called Coronal Sulcus and caudally called Caudolateral Sulcus. Occasionally an Ectolateral Sulcus can be observed between Caudal Suprasylvian Sulcus and Caudolateral Sulcus. A crossed sulcus located near coronal sulcus, arranged transversely. There may also two other gyrus, Post-Crusader and Pre-Crusader. Is still possible observe a Pre-Sylvian Sulcus, which is divided into Caudal and Rostral Branches, which together constitute the Proreus Sulcus. The rostral prolongation of Proreus sulcus is called Olfaction Sulcus.

In humans, as mentioned by Testut and Latarjet (1979) **[15]**, two gyrus cut longitudinally the Frontal Lobe: Superior Frontal Sulcus and Inferior Frontal Sulcus. A third frontal sulcus may be present parallel to

central sulcus, is the Pre-Central sulcus. The two longitudinal gyrus of Frontal Pole divide into three Gyrus: Superior Frontal Gyrus; Medial Front gyrus and Inferior Front gyrus. The Inferior Frontal gyrus can also be subdivided into Orbital, Triangular and Opercular.

Capuchin Monkey presents a Dorsolateral Face of Telencephalon with pattern of sulcus and gyrus that approaches more of humans and canids, but smaller number of sulcus and gyrus, since frontal faces of lobes are basically two gyrus. A transversal arranged gyrus, which dorsal end divides into rostral and caudal branch, resembling a letter T, is the prefrontal sulcus, which is lower and less defined than humans. Rostral to Precentral Sulcus is obliquely arranged, in rostocaudal sense, a rectilinear sulcus, the Frontal Sulcus or Sulcus Straight. As described in Cebids by Hill (1953, 1972a and 1972b) **[9,21,22]** that denominates Pruning Sulcus and Straight Sulcus. According to Miller, Christensen and Evans (1964), in dog, Lateral Sulcus is caudally called Caudolateral Sulcus. Occasionally, an Ectolateral Sulcus can be observed between Caudal Suprasylvian and Caudolateral Sulcus.

Testut and Latarjet (1979) **[15]** state that humans Parietal Lobe is above Interparietal Sulcus, parallel to Central Sulcus, located Postcentral Sulcus, also present in Capuchin Monkey, being denominated Rostral Branch of Parietoccipital Sulcus. The Occipital Lobe in humans occupies the posterior end of hemisphere and generally presents two no defined sulcus: Superior Occipital and Inferior Occipital Sulcus. In Capuchin Monkey, the Occipital pole occupies caudal end of hemisphere, dorsolateral face is represented by a single gyrus, the Occipital Gyrus. The temporal lobe occupies the inferior part of hemisphere and presents two longitudinal sulcus: Superior and Inferior **[15]**. In Capuchin Monkey, only an Intratemporal sulcus is observed, in accordance with cebids brains as described by Hill (1953, 1972a and 1972b) **[9,21,22]**.

Gyrus of Dorsolateral Face: The Dorsolateral Face of Capuchin Monkey Frontal Pole consists of three gyrus: a large Precentral Gyrus, disposed transversally and two smaller gyrus, Dorsal Frontal and Frontal Ventral positioned horizontally. In humans, according to Testut and Latarjet (1979) **[15]**, is also observable a pre-central gyrus, transversely are three horizontal frontal gyrus: inferior, medial and superior. Such circuconvolutions are not observed in dogs, since gyrus are continuous across hemisphere **[17]**. The same author demonstrates that rostral gyrus of dog is the Gyrus Proreus, located rostrally to Pre-Frontal Sulcus. Is possible observe on dorsolateral side, four other concentrically arranged gyrus: Sylvian, Ectosylvian, Suprasylvian and Lateral Gyrys, respectively, which can be subdivided into Rostral, Medial and Caudal parts. Rostral part of Ectosylvian Gyrus is called Coronal Gyrus. In parallel arrangement to FLM, can be identified the Lateral or Marginal gyrus, which is rostrally to Crossed Sulcus. The part that surrounds the crossed sulcus may also be called Sigmoid Gyrus. In Capuchin Monkey, Dorsolateral Surface of the hemisphere is less convoluted than humans and domestic dog, suggesting that the number and complexity of sulcus and gyrus is not always indicative of greater development, since dog, even phylogenetically placed inferior to monkey, exhibit more convoluted telencephalon. The number and complexity of sulcus and gyrus are more associated with the size of cranial box than the position on phylogenetic scale.

Sulcus and Gyrus of Ventrorostral Face: The ventrorostral face of human brain is represented by inferior face of frontal lobe, which is irregular and called as orbital lobe, which rests on dorsal wall of the orbit. In Orbital Lobe was identified the lateral orbital sulcus, the medial orbital sulcus and sulcus in H, which circumscribe right gyrus, medial orbital and lateral orbital. In Capuchin Monkey this face is more concave, being deeply marked by the orbit. At inferior concavity there is also an H-shaped Orbital Sulcus, which divides Ventrorostral Face into Lateral or Orbital and Medial or straight gyrus. A gyrus disposed caudorostrally and near to medial border of Frontal Lobe, is the Right Sulcus, which contains Olfactory Nerve Tract. According to Miller, Christensen and Evans (1964) **[17]**, this region of dogs is not concave and the main structures that stand out are Olfactory Bulb, Olfactory Stria and Olfactory Gyrus, which are pronounced and well-marked in dogs.

Gyrus and Sulcus of Medial Face: In humans and dogs, according to Testut and Latarjet (1979) **[15]** and Miller, Christensen and Evans (1964), Medial Face of each Hemisphere is relatively flat and vertically oriented and also verified in Capuchin Monkey. On this face are two sulcus: Corpus Callosum and Cingulate sulcus, which are observed in the three groups **[15]** and also in Capuchin Monkey, but absent in dogs **[17]**, in addition to Sulcus Calcarine, observed in humans and in Capuchin Monkey. In human, three sulcus divide Medial Face into: Medial Frontal Gyrus; Cingulate, Cuneus and Quadrilateral Lobe. In Dog, in humans and Capuchin Monkey, the Callosum Corpus is clearly delimited by the Sulcus of Callosum Corpus. Dorsally to the sulcus of Corpus Callosum, there is a well-defined gyrus, the Cingulus Gyrus, which is delimited above Cingulate Sulcus **[9,15,17,21]**. According to Miller, Christensen and Evans (1964) **[17]**, in dogs the Post-Splenial, Genual and Ectogenual gyrus are delimited by Genual, Ectomarginal, Post-splenial, Suprasplenial and splenial sulcus. In Capunchin Monkey there are two sulcus: Parietoccipital Sulcus and Post-splenial Sulcus. The encephalic mass above Cingulus Sulcus is the Marginal Gyrus and corresponds to medial border of

Dorsal Parietal and Dorsal Frontal. The Calcarine and Cingulate sulcus delimit Cingulate Gyrus. The Post-splenial Sulcus divides Cingulus Gyrus into Dorsal and Ventral Parts. The Calcarine and Parietoccipital Sulcus delimit the Cuneus Sulcus.

Sulcus and Gyrus of Ventral Face: According to Testut and Latarjet (1979) **[15]** in humans, inferior face presents Occiptotemporal Sulcus that separates Occiptotemporal, Medial and Lateral Gyrus, eventually being present a lateral Occipitotemporal sulcus. In Capuchin Monkey, the ventral face also presents Occipitotemporal sulcus that divides into Occipitotemporal and Temporal Ventral Gyrus. A relatively well marked sulcus, extending from Callosum Splenius Body to Calcarine Sulcus, is the Splenial Sulcus that delimits the ventral part of Cingulus Gyrus above and Occipitotemporal Gyrus ventrally. Medially, squeezed between Occipitotemporal Gyrus and cerebral peduncle is the small Hippocampus Gyrus. In dogs, on this face, a Rostral Rinal and a Caudal Rinal Sulcus are observed, in gyrus, delimits lateral area called Piriform Area.

V. CONCLUSION

The present study demonstrated that anatomic standard of Capuchin Monkey (*Cebus apella*) shows an external aspect similar to humans, nevertheless inferior convoluted and detailed analysis the brain showed inferior complex sulcus and gyrus, small number of sulcus and gyrus than domestic dog, besides located in higher phylogenetic scale. Our findings contribute to description and knowledge of an essential system to biological system of Capuchin Monkey.

CONFLIT OF INTESREST

The authors declare no conflicts of interest associated with this manuscript.

ACKNOWLEDMENTS

The authors thank “Centro de Triagem de Animais Silvestres de Catalão” for animal management.

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